Claims

What is claimed is:

1. In a wireless broadband system comprising a base transmitting to a plurality of subscribers, means for achieving an interactive bi-directional system comprising transmitter means in the subscriber system for transmitting signals which are orthogonal to the signals transmitted from other users arriving at the base station.

2. The means for achieving an interactive system according to claim 1, wherein the base transmission uses DVB-T or OFDM wireless communication channels, or another downlink scheme.

3. The means for achieving an interactive system according to claim 1, wherein the transmissions from the base include guard intervals, and wherein the transmitter means in the subscriber system include means for transmission synchronized with the guard intervals on the return channel to achieve orthogonality with the signals in the uplink.

4. The means for achieving an interactive system according to claim 1, wherein the transmitter means in the subscriber system include means for transmitting in a TDD or FDD mode, using a dedicated channel which is set apart from the broadcast channels.

5. The means for achieving an interactive system according to claim 4, wherein the transmitter means in the subscriber system include means for transmitting MAC messages without interference or for embedding control messages with the MPEG TS of the broadcast channel.

6. The means for achieving an interactive system according to claim 1, wherein the transmitter means in the subscriber system include means for transmitting in a FDD mode, using a dedicated channel set apart from existing broadcast channels, for the sole purpose of the return channel, to achieve orthogonality between the subscriber's signals arriving at the base station.

7. The means for achieving an interactive system according to claim 6, wherein the transmitter means in the subscriber system include means for transmitting MAC messages which are embedded in the MPEG TS.

8. The means for achieving an interactive system according to claim 1, wherein the transmitter means in the subscriber system include means for transmitting in in-band FDD or TDD mode, using one or more broadcast channels serving the return channel on FDD or TDD mode, to achieve orthogonality with the signals transmitted from the base station.

9. The means for achieving an interactive system according to claim 8, wherein the physical layer in the transmitter means in the subscriber system include FDD means which provides a separate frequency assignment for the up stream and down stream channels.

10. In a wireless broadband system comprising a base transmitting to a plurality of subscribers, a method for achieving an interactive bi-directional system comprising the steps of:

A. using a subscriber transmitter with an upstream physical layer based on the use of a combination of Time Division Multiple Access and Orthogonal Frequency Division Multiple Access;

B. dividing the upstream into a number of "time slots" as defined by the MAC layer;

C. controlling, in the MAC layer, the assignment of subchannels and time slots by bandwidth on demand and Data Rate on demand.

11. The method for achieving an interactive bi-directional system according to claim 10, wherein in step (B) each time slot is sized to the duration of one OFDM symbol.

12. The method for achieving an interactive bi-directional system according to claim 10, wherein in step (B) each time slot is divided in the frequency domain into groups of sub-carriers referred to as subchannels, that can arrive in groups or spread over the entire band.

13. The method for achieving an interactive bi-directional system according to claim 10, wherein a plurality of subscribers transmit simultaneously by using an OFDMA technique that provides data on OFDMA about the user, and wherein the data comprises a time of arrival, relative amplitude or power and the user's channel behavior including multipath.

14. The method for achieving an interactive bi-directional system according to claim 10, wherein the time of arrival at the base for a plurality of subscribers units are synchronized using Automatic Synchronization Control (ASC).

15. The method for achieving an interactive bi-directional system according to claim 10, wherein a plurality of subscribers units are power controlled by using Automatic Power Control (APC).

16. The method for achieving an interactive bi-directional system according to claim 10, wherein a plurality of subscribers units are allocated Sub-Channels in a specified OFDM Symbol by the MAC layer.

17. In a wireless broadband system comprising a base transmitting to a plurality of subscribers, a method for adaptive constellation modulation transmissions comprising the steps of:

A. measuring the channel performance for each user

B. setting a modulation scheme for each user responsive to the measured channel performance;

and wherein for high quality users the modulation is 256 QAM or 256 DAPSK, for intermediate quality users the modulation is 64 QAM or 64 DAPSK, for lower quality users the modulation is 16 QAM or 16 DAPSK, and for low quality users the modulation is 4 QAM or 4 DAPSK.

18. The method for adaptive constellation modulation transmissions according to claim 17, wherein the channel performance is indicated in the received signal quality and depending on the transmitted constellation for each user by MAC message.

19. The method for adaptive constellation modulation transmissions according to claim 17, further using pilot signals in the transmitted signal for recovering the clock of the base station and for using the clock as reference for all transmissions from the subscriber.

20. The method for adaptive constellation modulation transmissions according to claim 17, further using pilot signals in the transmitted signal for contention and synchronization, wherein the pilots are modulated in the frequency domain using one or more PN sequences.

21. The method for adaptive constellation modulation transmissions according to claim 20, further using the pilot signals to compute signal characteristics including the time of arrival, received power and multipath, and for using said characteristics for adaptive modulation.

22. The method for adaptive constellation modulation transmissions according to claim 17, further using a dynamic subcarriers allocation to subscribers wherein more subcarriers are allocated to subscribers who achieve better communications at a given time, to increase system throughput.